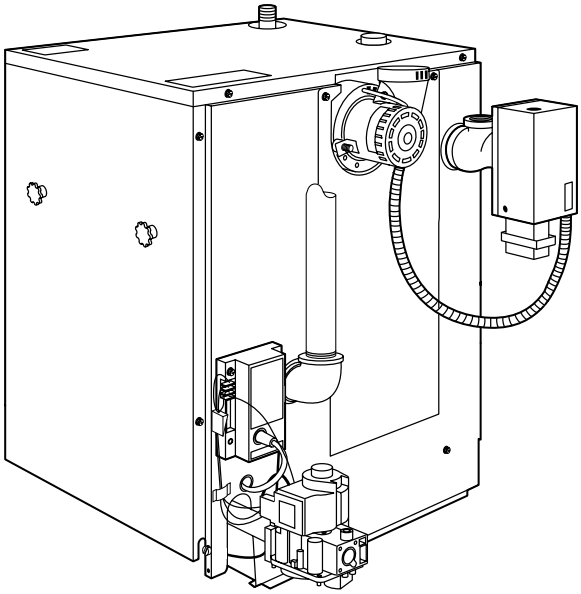
Installation, Start-Up, and Operating Instructions

Gas-Fired
Induced-Draft Hot Water Boilers
Sizes 42,500 through 225,000

BW3
Series B

NOTE: Read the entire instruction manual before starting the installation. These instructions must be affixed on or adjacent to the boiler.
This symbol → indicates a change since the last issue.

MODEL BW3



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Form: IM-BW3A-06 Cancels: IM-BW3A-05 Printed in U.S.A. 8-03 Catalog No. 63BW-3A2

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SAFETY CONSIDERATIONS

Installing and servicing heating equipment can be hazardous due to gas and electrical components. Only trained and qualified personnel should install, repair, or service heating equipment. Untrained personnel can perform basic maintenance functions such as maintaining water level. All other operations must be performed by trained service personnel. When working on heating equipment, observe precautions in literature, on tags, and on labels attached to or shipped with unit and other safety precautions that may apply.

→ Follow all safety codes. In the United States, follow all safety codes including the National Fuel Gas Code (NFGC) NFPA 54-2002/ANSI Z223.1-2002. In Canada, refer to the current edition of the National Standard of Canada CAN/CGA-B149.1- and .2-M00 Natural Gas and Propane Installation Codes (NSCNGPIC). Wear safety glasses and work gloves. Have fire extinguisher available during start-up and adjustment procedures and service calls.

Recognize safety information. This is the safety-alert symbol ⚠. When you see this symbol on unit or in instructions and manuals, be alert to potential for personal injury.

Understand the signal words DANGER, WARNING, CAUTION, and NOTE. These words are used with safety-alert symbol. DANGER identifies most serious hazards which **will** result in severe personal injury or death. WARNING signifies hazards which **could** result in personal injury or death. CAUTION is used to identify unsafe practices which **would** result in minor personal injury or product and property damage. NOTE is used to highlight suggestions which **will** result in enhanced installation, reliability, or operation.

INTRODUCTION

This boiler cannot be used with all types of chimneys. Read these instructions carefully before installing.

→ These Gas-Fired Hot Water Boilers are low-pressure, sectional cast iron boilers design certified by CSA International (A.G.A. and C.G.A.) for use with natural and propane gases. They are constructed and hydrostatically tested for a maximum working pressure of 50 psi in accordance with the American Society of Mechanical Engineers (A.S.M.E.) Boiler and Pressure Vessel Code Section IV Standards for cast iron heating boilers.

Check to be sure boiler size is correct before starting installation. See rating and capacity table shown in Fig. 1. Also be sure new boiler is for the type of gas being used. Check rating plate on right side of boiler.

The boiler must be supplied with correct type of gas, fresh air for combustion, and a suitable electrical supply. Boiler must also be connected to a suitable venting system and an adequate piping system. Finally, a properly located thermostat is needed for control of heating system. If there are any doubts as to the various requirements, check with local authorities and obtain professional help where needed. Take time to complete all the steps for SAFE and PROPER operation of heating system.

If this boiler is installed in a building under construction, special care must be taken to insure a clean combustion air supply during the construction process. Airborne particulates such as from drywall dust and from fiberglass insulation can clog the burner ports and cause incomplete combustion and sooting.

Where required by authority having jurisdiction, the installation must conform to American Society of Mechanical Engineers Safety Code for Controls and Safety Devices for Automatically Fired Boilers, No. CSD-1.

Before installing the boiler in the United States, refer to the current edition of the NFGC and the NFPA 90B. For copies of the NFGC and NFPA 90B, contact the National Fire Protection Association Inc., Batterymarch Park, Quincy, MA 02269; or for only the NFGC contact the American Gas Association, 400 N. Capitol St., N.W., Washington DC 20001.

Before installing the boiler in Canada, refer to the NSCNGPIC. For a copy of the NSCNGPIC, contact Standard Sales, CSA International, 178 Rexdale Boulevard, Etobicoke (Toronto), Ontario, M9W 1R3, Canada.

Installation must comply with regulations of serving gas supplier and local building, heating, plumbing or other codes in effect in the area in which installation is made. In absence of local building codes, installation must comply with NFGC in the United States and the NSCNGPIC in Canada.

The following steps are all necessary for proper installation and safe operation of boiler.

1. LOCATING THE BOILER
2. FRESH AIR FOR COMBUSTION
3. INSTALLATION—SYSTEM PIPING
4. CHIMNEY AND VENT PIPE CONNECTION
5. GAS SUPPLY PIPING
6. ELECTRICAL WIRING
7. CHECKING AND ADJUSTING

⚠ WARNING: To prevent fires or explosions, keep boiler area clean and free from combustible materials, gasoline, and other flammable vapors and liquids. Failure to follow this warning could result in explosion, electrical shock, fire, personal injury, or death.

⚠ WARNING: Improper installation, adjustment, alteration, service, maintenance, or use can cause carbon monoxide poisoning, explosion, fire, electrical shock, or other conditions which may cause personal injury or property damage. Consult a qualified installer, service agency, local gas supplier, or your distributor or branch for information or assistance. The qualified installer or agency must use only factory-authorized and listed kits or accessories when modifying this product. Boilers with cast iron burners are not to be converted to propane. Failure to follow this warning could result in electrical shock, fire, personal injury, or death.

NOTE: Installers—Follow local regulations with respect to installation of CO detectors. Follow maintenance recommendations in this instruction manual.

BOILER RATINGS AND CAPACITIES

The ratings marked "Net I=B=R Rating" indicate the amount of remaining heat input that can be used to heat the radiation or terminal units. The Net I=B=R Ratings shown are based on an allowance of 1.15 in accordance with the factors in the I=B=R Standard as published by The Hydronics Institute. New York City MEA Number 484-84-E-Vol. III.

Selection of boiler size should be based upon "Net I=B=R Rating" being equal to or greater than calculated heat loss of building.

Consult manufacturer before selecting a boiler for installations having unusual piping and pickup requirements.

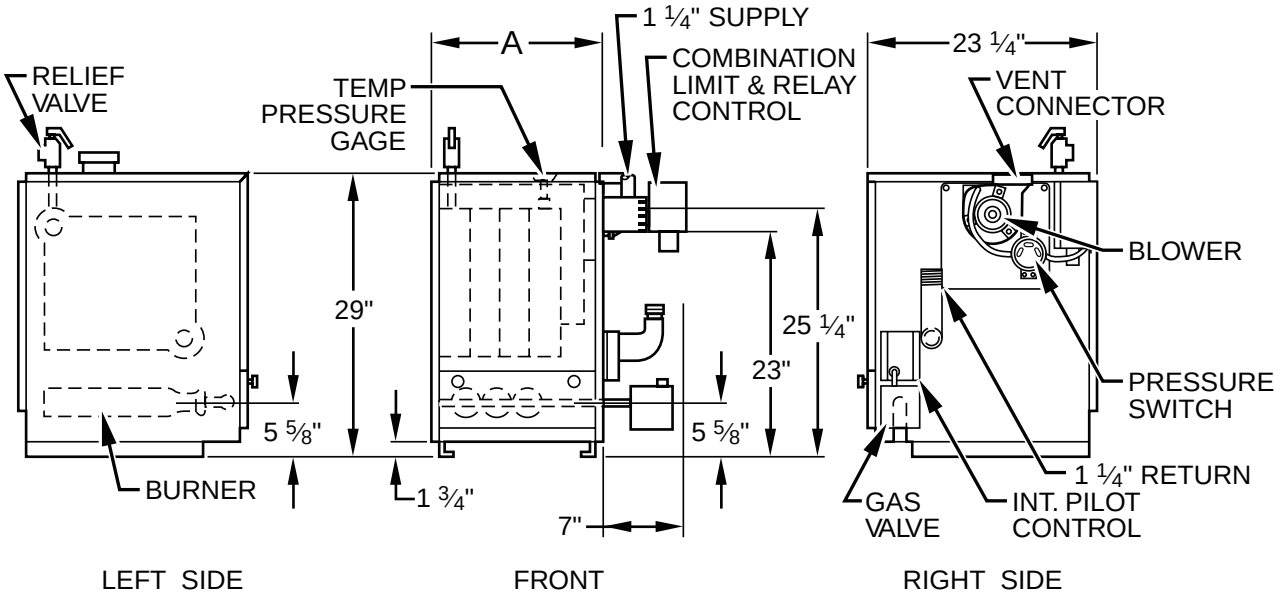
These boilers must stand on a non-combustible floor. If installed on a combustible floor, a factory-approved combustible floor base must be used.

BOILERS FOR USE AT HIGH ALTITUDE

This boiler is factory equipped for use at altitudes of 0-2000 ft above sea level. For use at altitudes above 2000 ft above sea level, input ratings are reduced by a change in main burner orifice size.

U.S.A. Only—For altitudes above 2000 ft above sea level, input ratings should be reduced at the rate of 4 percent for each 1000 ft above sea level. Consult the NFGC or the manufacturer for correct orifice sizing information. High-altitude orifices are available from boiler manufacturer.

Canada Only—For altitudes in the range of 2000-4500 ft above sea level, boilers may be field equipped for use at high altitude by using a certified field conversion kit. The change in main burner orifice size results in boiler's input rating being reduced by 10 percent. The conversion shall be carried out by a manufacturer's authorized representative in accordance with the requirements of manufacturer, provincial or territorial authorities having jurisdiction, and in accordance with the requirements of the CAN/CGA-B149.1 and CAN/CGA-B149.2 Installation Codes. The certified field conversion kit includes a conversion data plate which must be attached to boiler adjacent to rating plate indicating that boiler has been converted for high-altitude use. The conversion data plate must be filled in with the correct conversion information.



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Gas-Fired Hot Water Boilers

BOILER MODEL NUMBER*	NO. OF SECTIONS	NATURAL AND PROPANE GAS†			DIMENSIONS (IN.)	
		A.G.A. Input MBH	Heating Capacity MBH	Net I=B=R Rating MBH	Width A	Vent Diameter To Chimney (Category I)
BW3AAN000042ABAA	2	42.5	36	31	11	4
BW3AAN000075ABAA	3	75.0	63	55	14-1/4	4
BW3AAN000112ABAA	4	112.5	94	82	17-1/2	4
BW3AAN000150ABAA	5	150.0	125	109	20-3/4	4
BW3AAN000187ABAA	6	187.5	155	135	24	4
BW3AAN000225ABAA	7	225.0	186	162	27-1/4	4

* Sixth position of Model No. indicates natural or propane gas usage: N = Natural Gas
P = Propane Gas

† Boilers are equipped for altitudes up to 2000 ft only.
U.S.A Only—For altitudes above 2000 ft, ratings should be reduced at the rate of 4 percent for each 1000 ft above sea level.
Canada Only—Boilers may be used at high altitude by using a certified field conversion kit, resulting in 10 percent derate.
Heating Capacity is based on Department of Energy (DOE) test procedure.
MBH—1000 Btuh (British Thermal Unit Per Hr)

→ **Fig. 1—Dimensional Drawing and Boiler Ratings and Capacities**

LOCATING THE BOILER

NOTE: This unit MUST be set on a concrete or other non-combustible material base or floor.

1. Select level location as centralized with piping system and as near chimney as possible.
2. Place crated boiler at selected location. Remove crate by pulling crate sides from top and bottom boards. When boiler is to be installed on a combustible floor, a combustible floor base must be used.

   This boiler must NOT be installed on carpeting.
3. Boiler is to be level. Metal shims may be used under base legs for final leveling.
4. The floor supporting boiler must be non-combustible. If it is combustible, place the boiler on a factory-approved combustible floor base. We use a 2-in. Cladlite™ pad as a combustible floor base. These are available from your local supplier. Use a minimum 24-in. X 30-in. pad for 2-5 section boilers and a minimum 30-in. X 30-in. pad for 6-7 section boilers. The boiler must be centered on combustible floor base.
5. Additional clearances for service may exceed clearances for fire protection. Always comply with the minimum fire protection clearances shown on the unit. An 18-inch clearance should be maintained on any side where passage is required to access another side for cleaning, servicing, inspecting or replacement of any part that may need attention. An 18-inch clearance is recommended on the control side for servicing.
6. Determine boiler room size. Rooms that are large in comparison with the size of boiler are defined as rooms having a volume equal to or greater than 16 times the volume of the boiler. Where room ceiling height is greater than 8 ft, volume of room shall be figured on the basis of 8 ft ceiling height. Determination of room size should be based on total volume of all gas fired equipment installed in that room. (See Table 1.) Refer to Section 6.3 of NFGC, Central Heating Boilers and Furnaces for further information, including approved methods for reducing clearances in large rooms.
7. Table 2 shows minimum clearances from combustible materials.
8. Equipment shall be installed in a location in which the facilities for ventilation permit satisfactory combustion of gas, proper venting, and maintenance of ambient temperature at safe limits under normal conditions of use. Equipment shall be located so as not to interfere with proper circulation of air. When normal infiltration does not provide necessary air, outside air shall be introduced as described in Fresh Air for Combustion section.

Table 1—Room Large In Comparison With Boiler

BOILER SIZE (SECTIONS)	BOILER VOLUME (CU FT)	MINIMUM ROOM VOLUME REQUIRED TO BE LARGE ROOM (CU FT)*
2	4.3	68.7
3	5.6	89.0
4	6.8	109.3
5	8.1	129.5
6	9.4	149.8
7	10.6	170.1

* For room with single boiler only.

Table 2—Minimum Clearances From Combustible Materials and For Servicing

PART OF BOILER	ALCOVE OR ROOM NOT LARGE IN COMPARISON WITH BOILER (IN.)	ROOM LARGE IN COMPARISON WITH BOILER (IN.)
Top	6	6
Rear	6	6
Control Side	8	6
Opposite Control Side	6	6
Front	18	18
Flue/Vent Connector	6	6
Boiler Piping	1	1

9. Advise owner to keep air passages free of obstructions. Ventilation and combustion air must enter boiler room without restrictions.
10. The boiler shall be installed such that the automatic gas ignition system components are protected from water (dripping, spraying, rain , etc.) during appliance operation and service (condensate trap, control replacement, etc.).

FRESH AIR FOR COMBUSTION

Provision for combustion and ventilation air must be in accordance with Section 5.3 of NFGC, Air for Combustion and Ventilation, or applicable provisions of local building codes.

Canadian installations must be installed in accordance with NSCNGPIC and all authorities having jurisdiction.

⚠ WARNING: Be sure to provide enough fresh air for combustion. Enough air ensures proper combustion and ASSURES THAT NO HAZARD WILL DEVELOP DUE TO LACK OF OXYGEN. Failure to follow this warning can cause a fire, personal injury, or death.

You must provide for enough fresh air to assure proper combustion. The fire in the boiler uses oxygen. It must have a continuous supply. The air in a house contains only enough oxygen to supply the burner for a short time. Outside air must enter house to replace oxygen used by burner. Study the following examples to determine your fresh air requirements.

⚠ CAUTION: Air for combustion must not be contaminated by halogen compounds, which include fluoride, chloride, bromide, and iodide. These elements are found in aerosol sprays, detergents, bleaches, cleaning solvents, salts, air fresheners, and other household products. Excessive exposure to contaminated combustion air will result in safety and performance related problems.

→ **⚠ CAUTION: If a fireplace or a kitchen or bathroom exhaust fan is used, an outside air intake should be installed. These devices rob the boiler and water heater of combustion air which may cause a fire, personal injury or death.**

PROCEDURE 1—BOILER LOCATED IN UNCONFINED SPACE

EXAMPLE 1:

An unconfined space is defined as a space whose volume is not less than 50 cubic feet per 1,000 Btu per hour of the total input rating of all appliances installed in that space.

If your boiler is in an open area (unpartitioned basement) in a conventional house, air that leaks through cracks around doors and windows will usually be adequate to provide air for combustion. The doors should not fit tightly. Do not caulk cracks around windows.

Equipment located in buildings of unusually tight construction shall be provided with air for combustion, ventilation, and dilution of flue gases using methods described in example 2B or shall be specially engineered. The authority having jurisdiction must approve specially engineered installations.

PROCEDURE 2—BOILER LOCATED IN CONFINED SPACE

EXAMPLE 2A: ALL AIR FROM INSIDE THE BUILDING

The confined space shall be provided with two permanent openings communicating directly with an additional room(s) of sufficient volume so that combined volume of all spaces meets criteria for an unconfined space. The total input of all gas utilization equipment installed in combined space shall be considered in making this determination. Each opening shall have a minimum free area of one square inch per 1,000 Btu per hour of the total input rating of all gas utilization equipment in confined space, but not less than 100 square inches. One opening shall be within 12 inches of top and one within 12 inches of bottom of enclosure. The minimum dimension of air openings shall not be less than 3 inches.

EXAMPLE 2B: ALL AIR FROM OUTDOORS

The confined space shall communicate with the outdoors in accordance with examples 1 or 2. The minimum dimension of air openings shall not be less than 3 in. Where ducts are used, they shall be of the same cross-sectional area as free area of openings to which they connect.

1. Two permanent openings, one commencing within 12 inches of top, and one commencing within 12 inches of bottom of enclosure shall be provided. The openings shall communicate directly, or by ducts, with the outdoors or spaces (crawl or attic) that freely communicate with the outdoors.
   a. Where directly communicating with the outdoors or where communicating to the outdoors through vertical ducts, each opening shall have a minimum free area of 1 sq. in. per 4000 Btu per hour of total input rating of all equipment in enclosure. (See Table 3A.)
   b. Where communicating with the outdoors through horizontal ducts, each opening shall have a minimum free area of 1 sq. in. per 2000 Btu per hour of total input rating of all equipment in enclosure. (See Table 3B.)
2. One permanent opening commencing with 12 inches of top of enclosure shall be permitted where equipment has clearance of at least 1 inch from sides and back and 6 inches from front of appliance. The opening shall directly communicate with the outdoors or shall communicate through a vertical or horizontal duct to the outdoors or spaces (crawl or attic) that freely communicate with the outdoors and shall have a minimum free area of:
   a. 1 sq. inch per 3000 Btu per hour of the total input of all equipment located in enclosure (see Table 3C), and
   b. Not less than the sum of the areas of all vent connectors in confined space.

Table 3A—Fresh Air Duct Capacities for Vertical Ducts (Btuh)*

	100% FREE AREA	75% FREE AREA	25% FREE AREA
Fresh Air Duct Size (In.)	1/4-in. Mesh Screen	Metal Louvers	Wood Louvers
3" X 12"	144,000	108,000	36,000
8" X 8"	256,000	192,000	64,000
8" X 12"	384,000	288,000	96,000
8-1/2" X 16"	512,000	384,000	128,000

* 1 Square Inch per 4,000 Btuh

Table 3B—Fresh Air Duct Capacities for Horizontal Ducts (Btuh)*

	100% FREE AREA	75% FREE AREA	25% FREE AREA
Fresh Air Duct Size (In.)	1/4-in. Mesh Screen	Metal Louvers	Wood Louvers
3" X 12"	72,000	54,000	18,000
8" X 8"	128,000	96,000	32,000
8" X 12"	192,000	144,000	48,000
8-1/2" X 16"	256,000	192,000	64,000

* 1 Square Inch per 2,000 Btuh

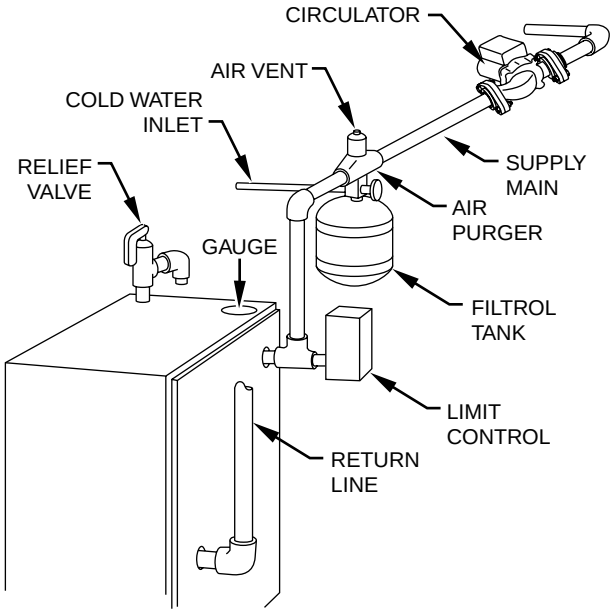
Table 3C—Fresh Air Duct Capacities for Vertical or Horizontal Ducts (Btuh)*

	100% FREE AREA	75% FREE AREA	25% FREE AREA
Fresh Air Duct Size (In.)	1/4-in. Mesh Screen	Metal Louvers	Wood Louvers
3" X 12"	108,000	81,000	27,000
8" X 8"	192,000	144,000	48,000
8" X 12"	288,000	216,000	72,000
8-1/2" X 16"	384,000	288,000	96,000

* 1 Square Inch per 3,000 Btuh

INSTALLATION—SYSTEM PIPING

1. Place boiler in selected location (as close to chimney as possible). Boiler is shipped assembled. Only the relief valve with a drain line to carry any water to a drain and a drain valve need to be installed.
2. Install relief valve on 3/4-in. pipe nipple in tapped opening in left end section. Connect a drain line of same pipe size (3/4 in.) to carry any water away to a drain. No shutoff of any description shall be placed between safety relief valve and boiler, or on discharge pipes between such safety valves and the atmosphere. Installation of safety relief valve shall conform to the requirements of the ANSI/ASME Boiler and Pressure Vessel Code, Section IV.
3. Install drain valve on lower left side of boiler as marked.
4. Connect supply and return lines to boiler. The connections may require certain additional fittings and parts. (See Fig. 2 and 4.)



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→ **Fig. 2—Forced Hot Water Typical Piping**

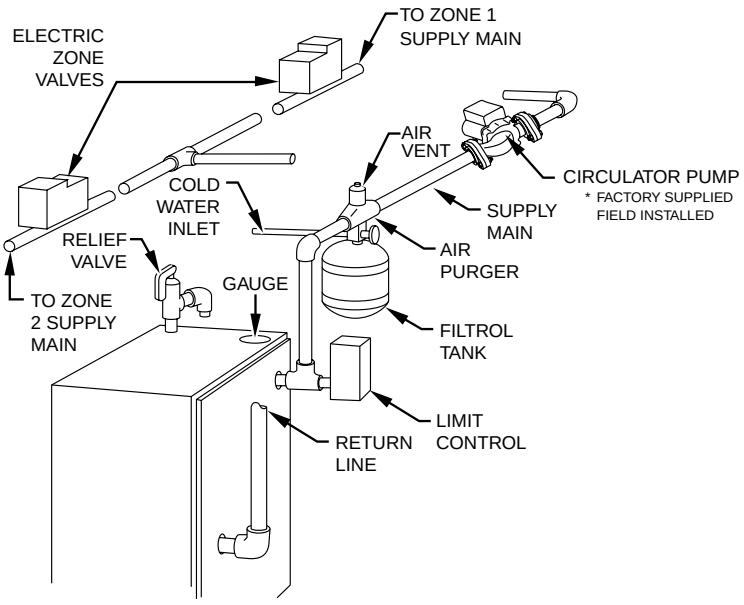

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Fig. 3—Forced Hot Water Typical Piping with Zone Control Valves

→ 5. Install factory supplied circulator pump on supply piping, after expansion tank and before any zone valves. Route electrical cable from aquastat relay and connect cable to circulator as shown in Fig. 7.

If installing an entire new heating system, first install all radiation units (panels, radiators, or cabinets) and supply and return mains, then make connections at boiler.

In connecting cold water supply to water valve, make sure that a clean water supply is available. When water supply is from a well or pump, a sand strainer should be installed at pump.

A hot water boiler installed above radiation level must be equipped with a low water cut-off device. A periodic inspection is necessary as is flushing of float-type devices per the manufacturer's specific instructions.

PROCEDURE 1—FOR USE WITH COOLING UNITS

When this boiler is used in connection with refrigeration systems, it shall be installed so that the chilled medium is piped in parallel with the heating boiler. Appropriate valves must be used to prevent the chilled medium from entering the heating boiler. (See Fig. 4.)

When this boiler is connected to heating coils located in air handling units where they may be exposed to refrigerated air circulation, piping system shall be equipped with flow control valves or other automatic means to prevent gravity circulation of boiler water during cooling cycles.

PROCEDURE 2—LOW DESIGN WATER TEMPERATURE SYSTEMS (BELOW 140°F)

If boiler is to be used in a heating system where design water temperatures below 140°F are desired (for example radiant floor heating), a 3-way or 4-way mixing valve or suitable alternative is required to prevent low temperature return water from entering boiler. Follow mixing valve manufacturer's Installation Instructions.

The minimum design return water temperature to boiler to prevent condensation in boiler and venting system is 120°F. The minimum high limit setting is 140°F.

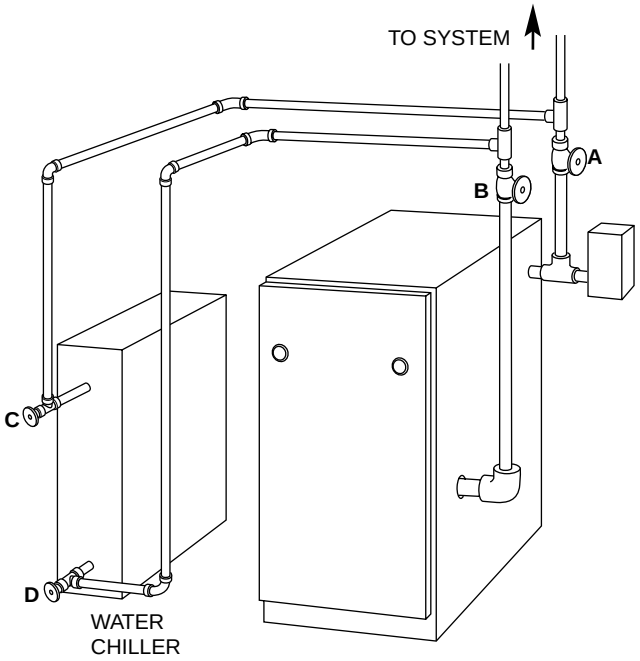
CHIMNEY AND VENT PIPE CONNECTION

For boilers with connections to gas vents or chimneys, vent installations shall be in accordance with Part 7 NFGC, Venting of Equipment, in the United States or Part 7 NSCNGPIC, Venting System and Air Supply for Appliances in Canada, and applicable provisions of local building codes.

PROCEDURE 1—CHECKING CHIMNEY

The chimney is a very important part of the heating system. It must be clean, the right size, properly constructed, and in GOOD CONDITION. No boiler can function properly with a bad chimney.

1. Use local codes for installation or NFGC. In Canada, follow CAN/CGA-B149.1 or .2 Installation Codes. It is very important to properly size the venting system for induced draft appliances. Consult the Vent Sizing Tables in Part 11 of the NFGC in the United States for correct sizing information. In Canada, consult the Vent Sizing Tables in Appendix B of the NSCNGPIC.



VALVES C & D
CLOSE FOR HEATING;
OPEN FOR COOLING

VALVES A & B
OPEN FOR HEATING;
CLOSE FOR COOLING

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→ **Fig. 4—Piping Arrangements for Boiler Used in Connection with Refrigeration System**

2. The boiler's induced draft blower has a 3-in. outlet. A 3-in. X 4-in. increaser fitting is included in parts bag. Locate increaser fitting on outlet of induced draft blower and secure gastight with a bead of the factory-supplied silicone sealant. The increaser fitting is required on this boiler for Category I venting, and 4 in. is the minimum permissible vent diameter. This does NOT imply that vent connector is intended to be 4-in. diameter pipe. The vent connector shall be sized according to the appropriate NFGC venting tables in the U.S.A. or the NSCNGPIC in Canada, and may be required to be larger than 4-in. diameter.

NOTE: The boiler installation for chimney venting is not complete unless the 3-in. X 4-in. increaser fitting is located and secured.

3. These are energy-efficient boilers with a low stack or exhaust temperature.
4. If venting into masonry chimney without a liner, line chimney from top to bottom with either:
   a. listed Type-B vent pipe
   b. listed flexible vent liner
   c. poured ceramic liner
5. Outside chimneys should not be used unless they are either:
   a. enclosed in a chase
   b. lined with Type-B vent pipe, listed flexible vent liner, or other certified chimney lining system
6. The vent connector from boiler to chimney should run as directly as possible with as few elbows as possible.
7. Where possible, it is recommended to common vent water heater and boiler. Consult the appropriate Vent Sizing Tables in either the NFGC or NSCNGPIC for specific requirements of multiple appliance venting.
8. If boiler is only appliance connected to vent, Type-B vent pipe is recommended for vent connector.
9. Slope pipe up from boiler to chimney not less than 1/4 in. per ft.
10. End of vent pipe must be flush with inside face of chimney flue. Use a sealed-in thimble for chimney connection.
11. The sections of vent pipe should be fastened with at least 3 sheet metal screws to make piping rigid. Use stovepipe wires to support pipe from above.
12. Do not connect to fireplace flue.
13. Do not install a damper on this boiler.

PROCEDURE 2—MINIMUM VENT PIPE CLEARANCE

If vent pipe must go through a crawlspace, Type-B vent pipe should be used. Where vent pipe passes through a combustible wall or partition, use a ventilated metal thimble. The thimble should be 4 in. larger in diameter than vent pipe.

If boiler is installed with single-wall vent, it must have a 6-in. clearance between its surface and any combustible material.

A new Type-B gas vent or flexible liner must be installed in accordance with instructions furnished with vent. Maintain clearances as specified for vent pipe.

Check vent pipe to see if it is firestopped where it goes through floor or ceiling. It should have an approved vent cap with clearances from roof shown in Fig. 5. If clearances are less than shown in Fig. 5, have vent checked by local authorities.

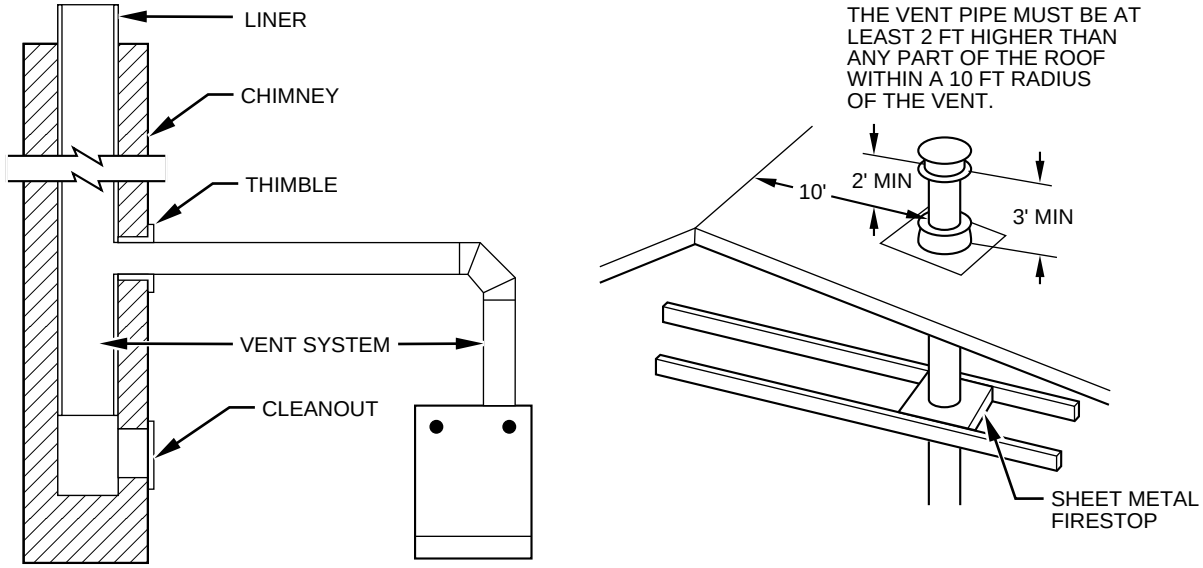

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Fig. 5—Type-B Gas Vent

Table 4—Boiler and Power Venter

BOILER SIZE (SECTIONS)	FIELD CONTROLS POWER VENTER KIT
2, 3, 4, 5	SWG-4D
6, 7	SWG-5D

For boilers with connections to gas vents or chimneys, vent installations shall be in accordance with Part 7 NFGC, Venting of Equipment, in the United States or Part 7 NSCNGPUC, Venting System and Air Supply for Appliances in Canada, and applicable provisions of local building codes.

Vent connectors serving appliances vented by natural draft shall not be connected into any portion of mechanical draft systems operating under positive pressure.

PROCEDURE 3—REMOVING EXISTING BOILER FROM COMMON VENTING SYSTEM

When an existing boiler is removed from a common venting system, common venting system is likely to be too large for proper venting of appliances remaining connected to it.

At time of removal of an existing boiler, the following items shall be followed with each appliance remaining connected to common venting system placed in operation, while other appliances remaining connected to common venting system are not in operation.

1. Seal any unused openings in common venting system.
2. Visually inspect venting system for proper size and horizontal pitch and determine there is no blockage or restriction, leakage, corrosion, and other deficiencies which could cause an unsafe condition.
3. Insofar as is practical, close all building doors and windows and all doors between space in which appliances remaining connected to common venting system are located and other spaces of building. Turn on clothes dryers and any appliances not connected to common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.
4. Place in operation appliance being inspected. Follow lighting instructions. Adjust thermostat so appliance will operate continuously.
5. Test for spillage at draft hood relief opening after 5 minutes of main burner operation. Use flame of a match or candle, or smoke from a cigarette, cigar, or pipe.
6. After it has been determined that each appliance remaining connected to common venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers, and any other gas-burning appliance to their previous conditions of use.

→ 7. Any improper operation of common venting system should be corrected so installation conforms with the NFGC. When resizing any portion of common venting system, common venting system should be resized to approach minimum size as determined using the appropriate tables in Part 11 of the NFGC in the United States or Appendix B or the NSCNGPIC in Canada.

NOTE: It is recommended that existing gas vents be checked to be sure they meet local codes.

OPTIONAL HORIZONTAL VENTING WITH POWER VENTER

Horizontal venting with a power venter is an alternate method of sidewall venting. This boiler is A.G.A. and C.G.A. listed for sidewall venting with standard single wall galvanized or Type-B vent pipe when using 1 of the power venter kits listed in Table 4. These kits are specifically sized for these boilers.

Some possible reasons for using a power venter for sidewall venting:

1. May be preferred by local codes.
2. Need a vent piping run beyond 30 ft (but not more than 50 ft).

3. Boiler installation site experiences gusting or high winds. A power venter can help prevent boiler from short cycling due to gusting or high winds by providing vent exhaust pressures greater than the boiler's induced draft blower alone.
4. When installer or homeowner prefers a negative pressure vent system instead of a positive pressure vent system.
5. May be more cost effective than stainless steel venting, particularly at longer vent lengths.

The Fields Controls power vent kit includes either a SWG-II-4HD or SWG-II-5 power venter, a MG-1 4-in. barometric draft controller, and the CK-43D controls kit.

Confirm that installing a power venter is an option allowed by local codes. For installation information, follow specific Installation Instructions provided with power venter kit.

NOTE: Although the power venter is equipped with its own fan, the fan on the boiler MUST remain in place and unaltered when a power venter is used.

When sidewall venting, flue gases must be vented to a point in relation to the prevailing wind so they may freely disperse without being blown back at building causing discoloration, or into building through doors or windows causing odors. Also, under certain conditions flue gases will condense, forming moisture. In such cases, steps should be taken to prevent building materials at vent terminal from being damaged by exhausted flue gas.

When installing single wall galvanized vent pipe for power venting, follow specific power venter Installation Instructions for layout, location of barometric draft control, and termination connections. When joining and sealing single wall galvanized or Type-B vent piping, use RTV silicone sealant with a minimum temperature rating of 400°F. For 3-in vent pipe runs, begin with female end of vent pipe over boiler's induced draft blower outlet. For 4-in. vent pipe runs, begin with 3-in. to 4-in. increaser fitting (included in boiler parts bag) over induced draft blower outlet. Then follow by placing female end of 4-in. vent pipe over increaser fitting. When joining pieces of single wall galvanized vent pipe, a substantial bead of silicone should be used at joint to insure a leak-proof connection.

GAS SUPPLY PIPING

PROCEDURE 1—CHECKING GAS SUPPLY

The gas pipe to boiler must be the correct size for length of run and for total Btuh input of all gas utilization equipment connected to it. See Table 5 for proper size. Be sure gas line complies with local codes and gas company requirements.

The boiler and its individual shutoff valve must be disconnected from gas supply piping system during any pressure testing of gas supply piping system at test pressures in excess of 0.5 psig (3.5 kPa).

The boiler must be isolated from gas supply piping system by closing its individual manual shutoff valve during any pressure testing of gas supply piping system at test pressures equal to or less than 0.5 psig (3.5 kPa).

PROCEDURE 2—CONNECTING GAS PIPING

Refer to Fig. 6 for general layout at boiler. It shows basic fittings needed. The gas line enters boiler from right side.

The following rules apply:

1. Use only those piping materials and joining methods listed as acceptable by the authority having jurisdiction or in the absence of such requirements, by the NFGC. In Canada, follow the CAN/CGA-B149.1 and .2 Installation Codes for Gas Burning Appliances and Equipment.
2. All pipe compound must be resistant to propane gas.
3. Install ground joint union in gas supply line between shutoff valve and boiler controls.

Table 5—Gas Pipe Sizes

NATURAL GAS				
Length of Pipe (Ft)	Pipe Capacity—Btuh Input Includes Fittings			
	1/2 in.	3/4 in.	1 in.	1-1/4 in.
20	92,000	190,000	350,000	625,000
40	63,000	130,000	245,000	445,000
60	50,000	105,000	195,000	365,000
PROPANE GAS				
Length of Pipe	Pipe Capacity—Btuh Input Includes Fittings			
	Copper Tubing*		Iron Pipe	
(Ft)	5/8 in.	3/4 in.	1/2 in.	3/4 in.
20	131,000	216,000	189,000	393,000
40	90,000	145,000	129,000	267,000
60	72,000	121,000	103,000	217,000

* Outside diameter.
NOTE: The length of pipe or tubing shown should be measured from gas meter or propane second-stage regulator.

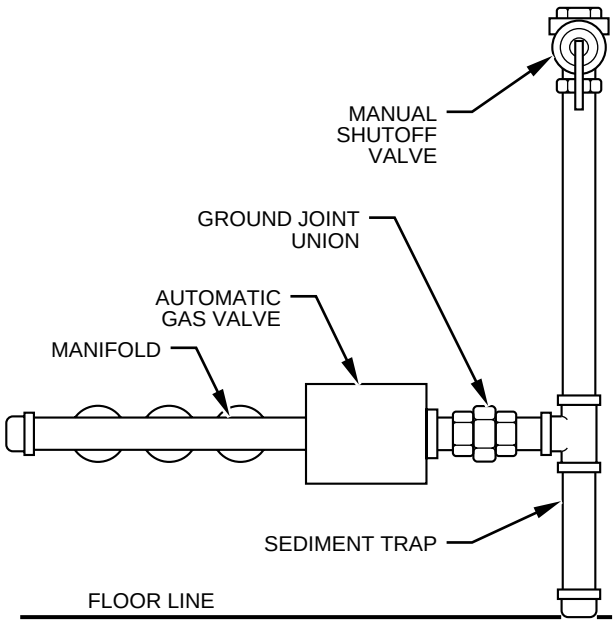

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Fig. 6—Gas Piping at Boiler

4. Install a sediment trap upstream of gas controls.
5. Use 2 pipe wrenches when making connection to gas valve to keep it from turning.
6. Install a manual shutoff valve in vertical pipe about 5 ft above floor.
7. Tighten all joints securely.
8. Propane gas connections should only be made by a licensed propane installer.
9. Two-stage regulation should be used by propane installer.
10. Propane gas piping should be checked be propane installer.

PROCEDURE 3—CHECKING GAS PIPING

Upon completion of piping, check immediately for gas leaks. Open the manual shutoff valve. Test for leaks by applying soap suds (or a liquid detergent) to each joint. Bubbles forming indicate a leak. CORRECT EVEN THE SMALLEST LEAK AT ONCE.

⚠ WARNING: Never use a match or open flame to test for leaks. Use a soap-and-water solution. A failure to follow this warning could result in fire, explosion, personal injury, or death.

ELECTRICAL WIRING

All electrical work must conform to local codes as well as the National Electrical Code (NEC) ANSI/NFPA-70-2002. In Canada, electrical wiring shall comply with the Canadian Electrical Code CSA C22.1.

See Fig. 7 for unit wiring diagram.

PROCEDURE 1—ELECTRIC POWER SUPPLY

⚠ WARNING: Turn off electric power at fuse box before making any line voltage connections. Follow local electric codes. Failure to follow this warning could result in electrical shock, personal injury, or death.

⚠ CAUTION: Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.

Run a separate 120-v circuit from a separate overcurrent protective device in electrical service entrance panel. This should be a 15-amp circuit. Locate a shutoff switch at boiler. It must be turned off during any maintenance. Connect 120-v power supply to aquastat terminals L1 (HOT) and L2.

The boiler, when installed, must be electrically grounded in accordance with requirements of the authority having jurisdiction, or in the absence of such requirements, with the NEC. Run a 14 gauge or heavier copper wire from boiler to a grounded connection in service panel or a properly driven and electrically grounded ground rod.

PROCEDURE 2—INSTALLING THERMOSTAT

Thermostat location has an important effect on operation of boiler system. BE SURE TO FOLLOW INSTRUCTIONS INCLUDED WITH THERMOSTAT.

Locate thermostat about 5 ft above floor on an inside wall. It may be mounted directly on wall or on a vertically mounted outlet box. It should be sensing average room temperature so avoid the following:

DEAD SPOTS:

Behind doors
Corners and alcoves

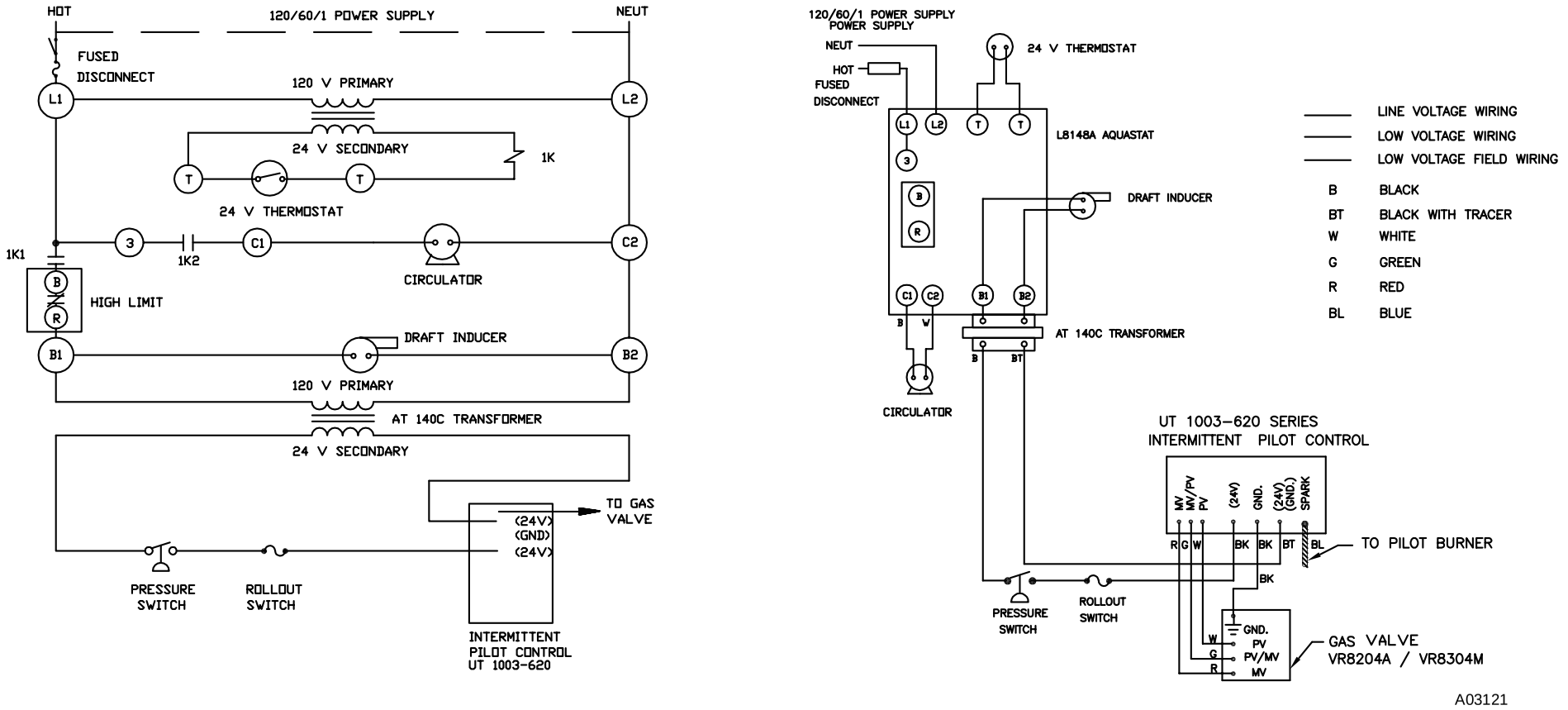
HOT SPOTS:

Concealed pipes
Fireplace
TV sets
Radios
Lamps
Direct sunlight
Kitchens

COLD SPOTS:

Concealed pipes or ducts
Stairwells—drafts
Doors—drafts
Unheated rooms on other side of wall

Set heat anticipator at 0.2 amps. The 24-v thermostat connects to aquastat terminals T and T.



NOTE: If any of the original wire as supplied with the boiler must be replaced, it must be replaced with the same wire or its equivalent.

Fig. 7—Unit Wiring Diagram

SEQUENCE OF OPERATION

1. Thermostat calls for heat, powering 1K relay coil and closing contacts 1K1 and 1K2.
2. Circulator pump is powered through terminals C1 and C2.
3. Induced draft blower and AT 140C transformer primary are powered through terminals B1 and B2.
4. When blower gets up to speed and blower suction pressure reaches pressure switch setpoint, pressure switch contacts close sending 24v to S8600 intermittent pilot control from AT 140C transformer secondary.
5. Pilot gas valve opens, and spark initiates to light pilot burner.
6. When pilot flame is proven, spark drops out.
7. Main gas valve opens and pilot burner ignites main burners.
8. If boiler water temperature reaches high limit setpoint, high limit contacts B-R open, cutting power to blower and S8600 intermittent pilot control. Burners extinguish and blower stops. Circulator pump continues to run as long as thermostat continues to call for heat. When boiler water temperature drops past high limit setpoint and through differential, high limit contacts B-R close, repeating items 3 through 7.
9. If venting system becomes blocked, blower suction pressure drops below pressure switch setpoint, opening pressure switch contacts and cutting power to S8600 intermittent pilot control. Burners extinguish, but blower remains powered as long as thermostat continues to call for heat. If venting system clears, items 4 through 7 repeat.
10. Thermostat is satisfied, ending call for heat. Relay coil 1K is de-energized, opening 1K1 and 1K2 contacts. Burners extinguish. Blower and circulator pump stop.

EQUIPMENT AND OPTIONAL ACCESSORIES

PROCEDURE 1—RELIEF VALVE

A relief valve must be installed on boiler. Water expands as it is heated. If there is no place for water to expand into, water pressure builds up inside boiler and system. Should this happen, relief valve automatically opens at a predetermined pressure. This relieves strain on boiler and system. Run a pipe from relief valve outlet (pipe must be same size as outlet, and open end must not be threaded) to an open drain, tub or sink, or other suitable drainage point not subject to freezing. Failure to do so may cause water damage or injury should relief valve release.

PROCEDURE 2—EXPANSION TANK (Optional)

In a properly assembled system, expanding water flows into expansion tank. This tank should be of the correct size.

The tank is filled with air. As water expands, it compresses air in tank to form an air pressure cushion. This "spring-like" cushion serves to maintain correct operating water pressure regardless of water temperature. This assures a "full measure" of water even in the highest radiation unit of system. It also prevents blowing off the relief valve.

The air in tank in the beginning (with system filled with cold water) is sufficient for proper operation. The tank also serves as a trap for excess air in system. This air would cause gurgling in pipes and inefficient circulation in radiators if left in system.

It is possible for a tank to become "water-logged" (filled with water). It can also become overfilled with air. This can happen after filling system with new water. Fittings are provided on tank and in line to tank for bleeding off excess water or air.

When installing this tank, the following are important:

1. Tank should be higher than boiler top.
2. Pipe to tank should continuously rise up to tank (so that air can "bubble" up to it).

PROCEDURE 3—DIAPHRAGM-TYPE EXPANSION TANK (Optional)

The diaphragm-type expansion tank (EX-TROL) takes the place of a conventional expansion tank. Read instructions packed with EX-TROL tank assembly carefully.

The EX-TROL tank comes with a 10-12 psi air charge. This is same as pressure produced in system by automatic fill valve. When system is first filled, EX-TROL tank contains little or no water.

As water is heated, its pressure increases. It expands into EX-TROL tank compressing air in tank. This compressed air cushion permits water in system to expand as temperature changes.

PROCEDURE 4—AIR-ELIMINATING FITTING (AIR PURGER) (Optional)

An air purger is used to remove excess air from system. It is installed in supply line. It helps eliminate air from water before it reaches radiators and bleeds off this air.

PROCEDURE 5—MAIN AIR VENT FOR DOWNFLOW SYSTEMS OR DIAPHRAGM-TYPE EXPANSION TANK (Optional)

Before a system is filled with water, there is air in pipes and radiation units. Some of it will be trapped as system fills. It is possible to eliminate most of this air through air vents on radiation units. A main air vent speeds and simplifies this process. It should be installed on highest point in supply main when all radiation is below top of boiler.

PROCEDURE 6—AUTOMATIC FILL VALVE (Optional)

For safe, efficient operation, a hot water system must be FILLED with water. Adding new water when needed can be done manually (by use of a hand valve in water supply line). This requires regular attention to system's needs. An automatic fill valve accomplishes this without attention. It is installed in supply line on hot water boilers only. The valve operates through water pressure differentials. It does not require electrical connection.

PROCEDURE 7—DRAIN VALVE

This manual valve provides a means of draining all water from boiler and system. It is often installed in the 3/4-in. tapping at bottom of left boiler section. It can also be installed in a tee where return line enters boiler.

PROCEDURE 8—WATER TEMPERATURE CONTROL

The water temperature limit control in relay is adjustable and may be set as necessary. It may be set as low as 140°F or as high as 240°F. Setting depends on type and amount of radiation involved and weather conditions.

PROCEDURE 9—CIRCULATING PUMP

Every forced hot water system requires a circulating pump. A separate pump or zone valve is required for each zone if there are 2 or more zones. This pump must have capacity to provide circulation required by system.

→ For optimum performance, pump is connected to supply piping AFTER expansion tank and before any zone valves. Connect pump to aquastat using 5 foot of cable attached to aquastat. The pump may also be connected to return main using same cable.

PROCEDURE 10—BLOWER (DRAFT INDUCER)

The blower provides a means for pulling air through boiler and exhausting flue gases into vent system. The blower shuts off when burners are not firing. This keeps heat in house rather than losing it up chimney.

PROCEDURE 11—PRESSURE SWITCH

The air pressure switch works on a negative pressure. When blower comes on, air pressure switch operates intermittent pilot and gas valve. The air pressure switch is factory set and only works when blower operates properly. It prevents boiler from starting if blower does not generate enough pressure or if venting system is blocked.

The factory-set pressure switch setpoint is as follows:

-0.4 in. wc for 2-5 section boilers

-0.5 in. wc for 6-7 section boilers

PROCEDURE 12—ROLLOUT SWITCH (FLAME ROLLOUT SAFETY SHUTOFF)

The rollout switch is a temperature-sensitive fuse link device. It is located on boiler base just outside fire box. In the event of heat exchanger flueway blockage causing flame to roll out of fire box, the fuse blows shutting down flow of gas to main burners. The fuse does not change in appearance when blown.

If rollout switch blows, it must be replaced with an exact replacement. Check heat exchanger flueways for blockage when restoring system to operating condition. Do not operate system without a rollout switch.

STARTING BOILER

PROCEDURE 1—HOW A HOT WATER SYSTEM OPERATES

The entire heating system (boiler, piping, and radiation units) is filled with water. As water in boiler is heated, it is pumped from top of boiler through supply main to radiation units. The cooler water in them flows back through return main to boiler. This provides positive and rapid response to thermostat.

PROCEDURE 2—FILLING SYSTEM WITH WATER

To fill:

1. Close air vents on all radiation units. Open valves to these units.
2. Make sure boiler and expansion tank drain cocks are closed. The air bleed screw on tank drain fitting should be closed.
3. Open valve in line from boiler to expansion tank. Refer to Maintaining Boiler section for additional information.
4. Open water inlet to boiler and leave it open.
5. Start with LOWEST radiation unit. Open air vent on this unit. When all air has escaped and water starts to flow from vent, close air vent.
6. Proceed to next lowest radiation unit and repeat process outlined in item 5. Repeat until every radiation unit in system has been covered. End with highest unit in system. If units have automatic vents, this manual venting is unnecessary but speeds up proper filling of system.

If system is a closed expansion tank system, there may be an automatic fill valve. It may be left open to refill system automatically as needed. Check temperature-pressure gauge. Note position of hand indicating pressure. This should be between 10 and 15 lb. Any lowering of this movable hand below 10 lb indicates loss of water due to leakage. The automatic fill valve should compensate for this. Instructions are packaged with valve.

→ ⚠ **CAUTION: Never run water into a hot, empty boiler or thermal shock may crack boiler components (sections).**

FOR YOUR SAFETY READ BEFORE OPERATING

⚠ **WARNING: If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury, or death.**

This appliance is equipped with an ignition device which automatically lights burner. Do NOT try to light burner by hand.

BEFORE OPERATING, smell all around appliance area for gas. Be sure to smell next to floor because some gas is heavier than air and will settle on the floor.

⚠ WARNING: IF YOU SMELL GAS:
- **Do not attempt to operate any appliance; do not touch any electric switch; do not use any phone in your building.**
- **Leave the building immediately and call your gas supplier.**
- **If your gas supplier cannot be reached, call the fire department.**

⚠ WARNING: When turning gas control knob, use only your hand to turn knob. Never use tools. If knob will not operate by hand, control must be replaced by a qualified service technician. Force or attempted repair may result in a fire or explosion.

→ **⚠ WARNING: If any part of this appliance has been under water, do not operate. Immediately call a qualified service technician to inspect the appliance and to replace any part of gas control system which has been under water. Electrical hazard or improper unit operation may occur and could result in electrical shock, personal injury, or death.**

GAS VALVE OPERATING INSTRUCTIONS

A. To Turn On Gas To Appliance

1. STOP! Read safety information in For Your Safety Read Before Operating section.
2. Set thermostat to lowest setting.
3. Turn off all electrical power to appliance.
4. This appliance is equipped with an ignition device which automatically lights burner. Do NOT try to light burner by hand.
5. Remove burner access panel.
6. Turn gas control knob clockwise to OFF position. (See Fig. 8.)

⚠ WARNING: Wait 5 minutes to allow any gas in the combustion chamber to vent. If you then smell gas in appliance area or near the floor, do not touch any electrical switch; do not use the phone. Leave the building immediately and call your gas supplier. If your gas supplier cannot be reached, call the fire department. Failure to do so may result in a fire or explosion. If you do not smell gas, go to the next item.

7. Turn gas control knob counterclockwise to ON position. (See Fig. 8.)
8. Turn on all electrical power to appliance.
9. Set thermostat to desired setting.
10. After visually inspecting flame, replace lower front panel.

→ **⚠ WARNING: If appliance will not operate after several tries, turn gas control knob to OFF position and call your service technician or gas supplier to prevent personal injury, death, or property damage.**

B. To Turn Off Gas To Appliance

1. Set thermostat to lowest setting.
2. Turn off all electric power to appliance if service is to be performed.
3. Turn gas control knob clockwise to OFF position. (See Fig. 8.) Do not force.

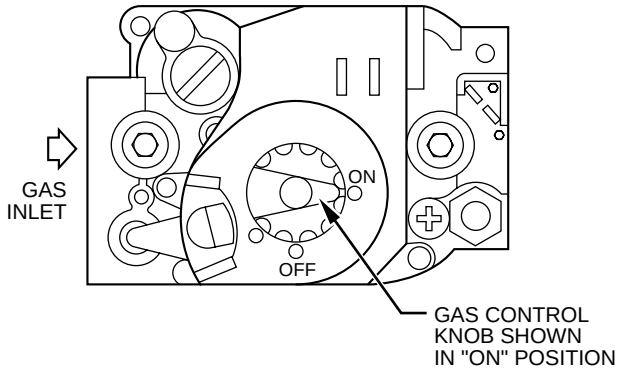


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Fig. 8—Gas Valve

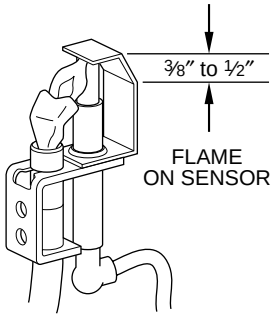

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Fig. 9—Pilot Flame and Sensor

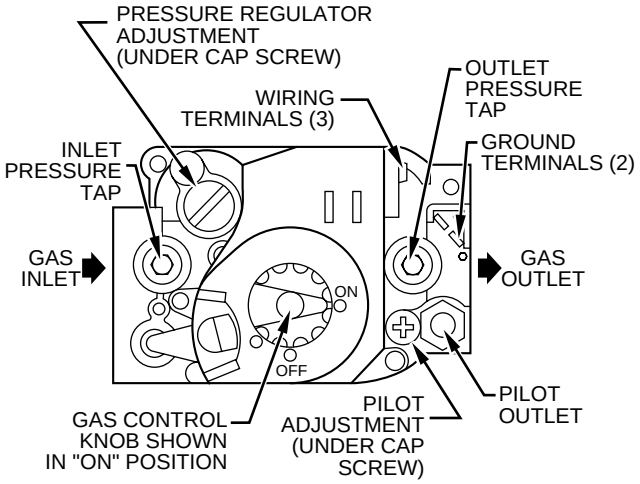

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Fig. 10—Automatic Gas Valve

Table 6—Recommended Boiler Water Temperatures

TYPE OF HEATING UNIT	LIMIT CONTROL SETTING
Standing Radiators	180°F
Baseboard and Convector Radiators	200°F

CHECKING AND ADJUSTING

PROCEDURE 1—GAS VALVE SAFETY SHUTDOWN TEST

With main burners firing, disconnect ignition cable from intermittent pilot control box. Gas valve should shut off main burners. TURN OFF ELECTRIC POWER to boiler before reconnecting ignition cable to prevent electric shock.

PROCEDURE 2—PILOT BURNER ADJUSTMENT

Pilot flame should surround 3/8- to 1/2-in. of pilot sensor. (See Fig. 9.) If flame needs adjusting, proceed as follows:

1. Remove screw cover over pilot adjusting screw. (See Fig. 10.)
2. Insert small screwdriver and adjust flame as needed. (See Fig. 9 and 11.) Turn screw counterclockwise to increase flame and clockwise to decrease flame.
3. Replace screw cover over pilot adjusting screw.

PROCEDURE 3—MAIN BURNER(S)

The main burners do not require primary air adjustment and are not equipped with primary air shutters. Main burner flames should form sharp blue inner cones in a softer blue outer mantel, with no yellow. Puffs of air from blowing on flame or stamping on floor will cause flames to turn orange momentarily. This is not unusual. Remain still when observing the main burner flames. If flame appearance is not correct, check main burner orifices and burner throat and flame ports for dust and lint obstruction. It may be necessary to remove rollout shield to observe main burner flames. Replace rollout shield after observation. (See Fig. 11.)

PROCEDURE 4—LIMIT CONTROLS ADJUSTMENT

Instructions for each control are included with controls.

Table 6 shows recommended boiler water temperatures. These settings can be changed after becoming familiar with system operation. For example, if system is not giving quite enough heat in very cold weather, the limit setting can be raised to 220°F.

PROCEDURE 5—THERMOSTAT HEAT ANTICIPATOR ADJUSTMENT

Instructions for final adjustment of thermostat are packaged with thermostat.

Set heat anticipator at 0.2.

Check thermostat operation. When set above temperature indicated on thermometer, boiler burners should ignite. Make certain thermostat shuts boiler off when room temperature reaches selected setting and starts boiler operating when room temperature falls a few degrees.

PROCEDURE 6—SAFETY CONTROLS CHECK

After setting limit control to desired setting, check to see if it shuts off gas supply to burners. Set thermostat to call for heat and let boiler run until temperature of water reaches limit setting. Gas valve should shut off and circulator should keep running until thermostat is satisfied or water cools enough to restart burners through limit control.

To check operation of contacts in pressure switch, disconnect rubber tubing (located between blower and pressure switch) from pressure switch while boiler is operating. The burners should extinguish, and blower should keep running. When tubing is reconnected to pressure switch, ignition sequence should begin, resulting in ignition of main burners.

Finally, set thermostat for desired temperature. Special conditions in home and location of thermostat govern this setting.

Safe lighting and other performance criteria were met with gas manifold and control assembly provided on boiler when boiler underwent tests specified in ANSI Z21.13.

MAINTAINING BOILER

PROCEDURE 1—BURNERS

A visual check of pilot and main burner flames should be made at least once each year, preferably at beginning of heating season. See Checking and Adjusting section and Fig. 9, 11, and 12. Main burner flame should form a sharp blue cone with no yellow.

PROCEDURE 2—RELIEF VALVE

This valve should open automatically when system pressure exceeds pressure rating (usually 30 psi) of relief valve. Should it ever fail to open under this condition, shut down system. Drain system until pressure is reduced below relief valve pressure rating. If valve discharge occurs or if valve fails to open as described above, contact an authorized contractor or qualified service technician to replace relief valve and inspect heating system to determine the cause, as this may indicate an equipment malfunction.

This valve should be tested every month during periods of boiler operation, and at the beginning and end of any extended non-service period. Prior to testing, make certain discharge pipe is properly connected to valve outlet and arranged so as to contain and safely dispose of boiler discharge. Test at normal system operating pressure. Hold trip lever fully open for at least 5 sec in order to flush free any sediment that may lodge on valve seat, then permit valve to snap shut.

PROCEDURE 3—EXPANSION TANK

As previously noted, this tank may become waterlogged or may receive an excess of air. Frequent automatic opening of relief valve indicates waterlogging. A high boiler temperature accompanied by unusually low radiation unit temperature (and "knocking") indicates excess air in tank.

To correct either condition, close valve between boiler and tank. Drain tank until it is empty. Check all tank plugs and fittings. Tighten as necessary. Open valve between boiler and tank. Water will rise to normal height in tank if automatic fill valve is installed, otherwise, manually refill system.

PROCEDURE 4—BOILER FLUE PASSAGES

Under normal operating conditions with burners properly adjusted, it should not be necessary to clean boiler flue gas passages. However, to assure trouble-free operation, we recommend that flue passages, burner adjustment, and operation of controls be checked ONCE EACH YEAR by a competent service technician.

BEFORE THE START OF EACH SEASON (or whenever system has been shut down for some time), recheck whole system for leaks and recheck boiler and vent pipe for leaks. Replace or patch any boiler seals that are faulty.

PROCEDURE 5—VENT PIPE

The venting of this unit is very important. Piping should be checked at least once a month. If vent piping shows any signs of leaking, replace it immediately.

PROCEDURE 6—WATER SYSTEM

If system is to remain out of service during freezing weather, always DRAIN IT completely. Water left in to freeze will crack pipes and/or boiler.

PROCEDURE 7—CLEANING BOILER AND BURNERS

Flue passages between sections should be examined yearly and cleaned if necessary. To clean:

1. Remove burners, pilot, and vent pipe.
2. Remove top and front jacket panels.
3. Split silicone seal on flue collector and cleanout plates with a razor knife.
4. Remove flue collector.
5. Remove cleanout plates by tapping upwards on bottom of plate with a hammer.
6. Remove loose silicone sealant from sections, flue collector, and cleanout plates.
7. Clean passageways between sections with a flexible handle wire brush and a straightened out wire coat hanger. Remove dirt from bottom of boiler and between sections by vacuuming.
8. Make sure all flame ports in burners are open and clear. Shake out or blow out all loose dirt in burners.
9. Reassemble all parts.
10. Seal flue collector and cleanout plates to sections with 400°F RTV silicone sealant or equivalent.
11. Reseal seams between adjacent sections as necessary. All joints MUST be airtight.
12. Be sure to check tightness of pilot connections and condition of burner flames after reassembly. (See Fig. 11.)

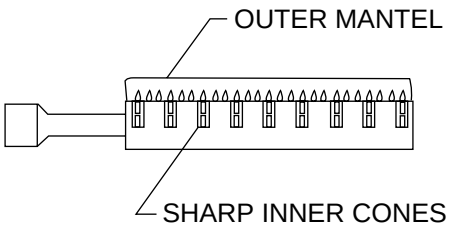

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Fig. 11—Main Burner Flame

13. Be sure vent pipe connections to chimney are secure and no obstructions are present.

PROCEDURE 8—BLOWER

The blower motor features permanently lubricated ball bearing construction. Lubrication is not required.

SERVICE HINTS

You may avoid inconvenience and service calls by checking these points before you call for service.

FOR YOUR SAFETY

WHAT TO DO IF YOU SMELL GAS

1. Do not try to light any appliance.
2. Do not touch any electric switch; do not use the phone.
3. Leave the building immediately, then call your gas supplier.
4. If you cannot reach the gas supplier, call the fire department.

IF SYSTEM IS NOT HEATING OR NOT GIVING ENOUGH HEAT. . .	
Possible Cause	**What To Do**
Thermostat is not set correctly	Reset thermostat above room temperature.
Burner is not operating properly	Check flame. If it is yellow, burner is not getting enough air. If flame is blue and noisy and seems to lift off the burner, burner is getting too much air. Contact your service technician.
No electric power to boiler	Check overcurrent protection. Check to be sure electric power supply circuit is on.
Controls out of adjustment	Reset according to instructions.
Radiators not heating	Open radiator vents to vent excess air. Check flow control valve (if used). It may be in closed position.
Circulator pump not running	Check overcurrent protection. Check relay operation.
Poor electrical contact	Check all control terminals and wire joints.
Chimney flue is blocked	Pressure switch will not close and pilot spark will not operate to start pilot. Have your service technician check and correct, if necessary.
Rollout switch blown	Have your service technician check heat exchanger for blockage. Replace rollout switch with exact replacement.
IF BURNER IS NOISY. . .	
Possible Cause	**What To Do**
Gas input amount is incorrect	Contact your service technician.
RELIEF VALVE LEAKING. . .	
Possible Cause	**What To Do**
Dirt on seat	Open valve manually. Allow water to run and clear valve seat.
Waterlogged expansion tank	Drain tank. See instructions.

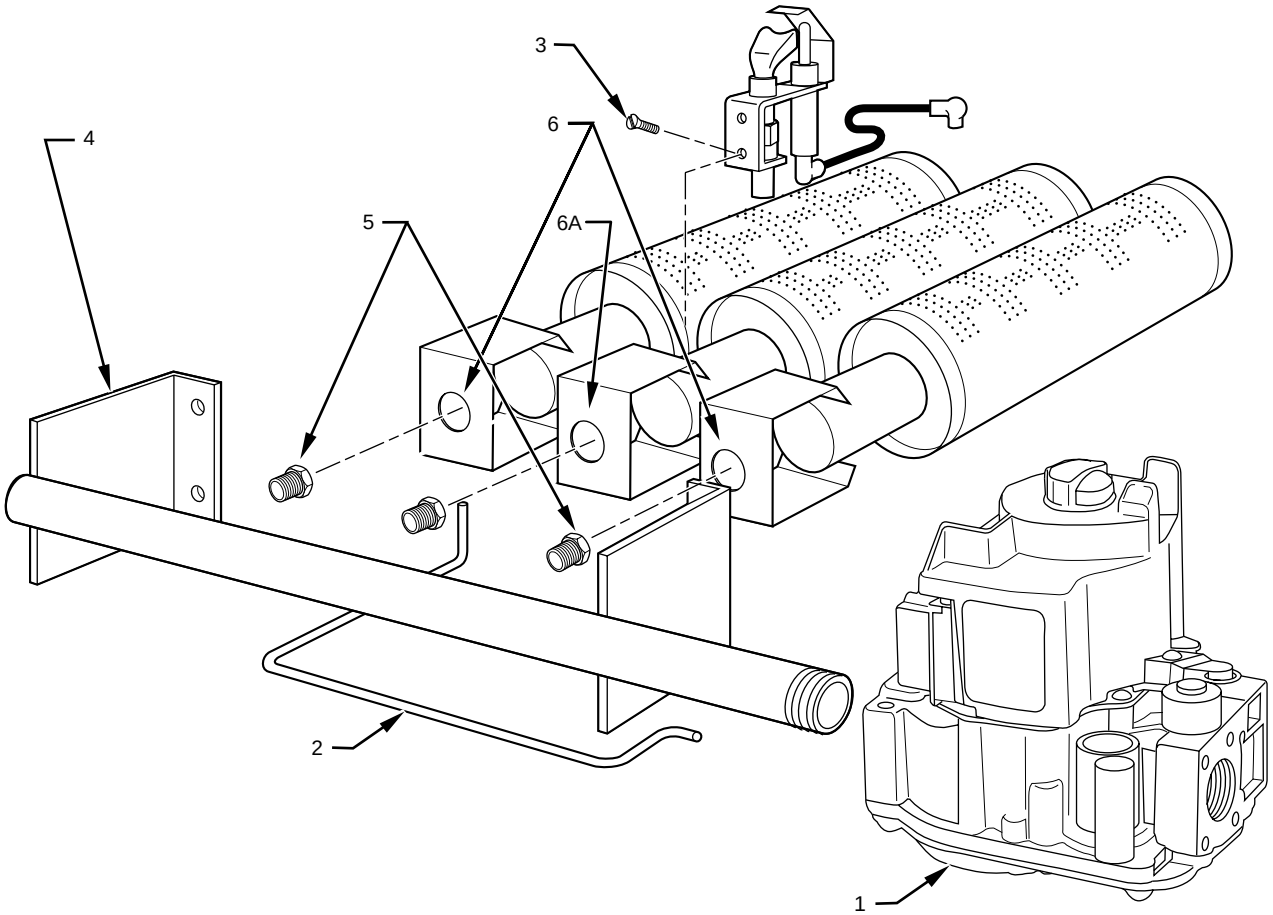
HAVE YOUR SERVICE TECHNICIAN CHECK ANY PROBLEM YOU ARE UNABLE TO CORRECT.

REPAIR PARTS

IMPORTANT — READ THESE INSTRUCTIONS BEFORE ORDERING All parts listed in the following Parts List may be ordered through your nearest supplier.

When ordering parts, first obtain Model No. from data plate on boiler, then determine Part No. (not Key No.) and Description of each part from the following illustrations and lists. Be sure to give all this information: Part No. — Part Description — Boiler Model No.

FOR USE WITH NATURAL GAS ONLY



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→ **Natural Gas Burners and Manifold Parts**

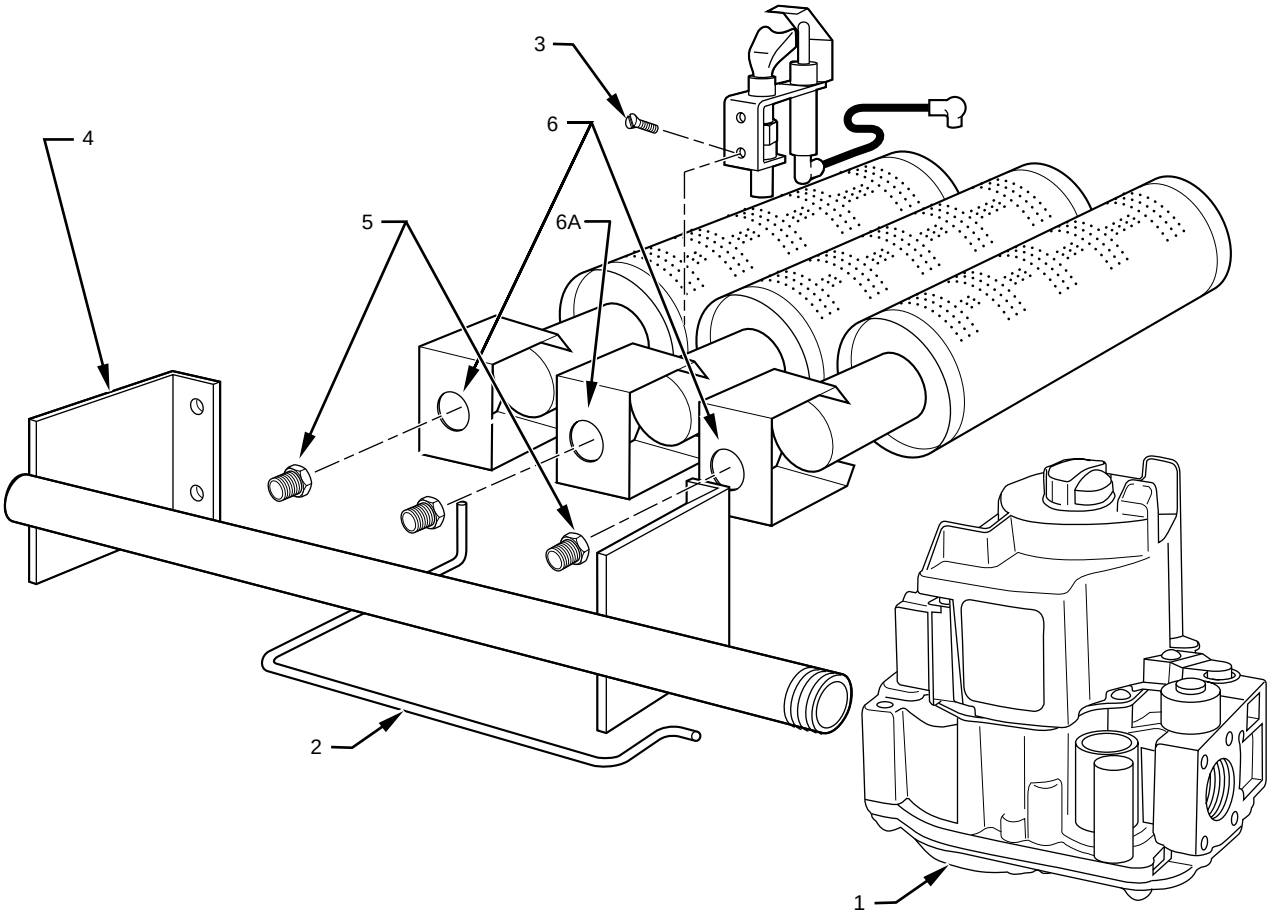
This is a Repair Parts List—Not a Packing List

KEY NO.	DESCRIPTION	PART NO.					
		2 Section	3 Section	4 Section	5 Section	6 Section	7 Section
1	24-v Gas Valve, Natural Gas	146-62-052	146-62-052	146-62-052	146-62-052	146-62-058	146-62-058
2	Pilot Tube	146-15-005	146-15-005	146-15-005	146-15-005	146-15-006	146-15-006
3	10-32 X 1/2-in. Hex Head Screw	146-95-301	146-95-301	146-95-301	146-95-301	146-95-301	146-95-301
4	Gas Manifold	146-16-042	146-16-043	146-16-044	146-16-045	146-16-024	146-16-025
5	Main Burner Orifice*	146-15-030	146-15-030	146-15-030	146-15-030	146-15-036	146-15-036
6	Main Burner Less Pilot Bracket†	—	146-15-532	146-15-532	146-15-532	146-15-532	146-15-532
6A	Main Burner with Pilot Bracket	146-15-531	146-15-531	146-15-531	146-15-531	146-15-531	146-15-531
7	Pilot Burner	146-62-100	146-62-092	146-62-092	146-62-092	146-62-092	146-62-092
‡	Rollout Shield	425-00-932	425-00-933	425-00-934	425-00-935	425-00-936	425-00-937

Quantity is 1 unless otherwise noted.
* Requires 1 less than the number of sections.
† Requires 2 less than the number of sections.
‡ Not illustrated.

REPAIR PARTS

FOR USE WITH PROPANE GAS ONLY



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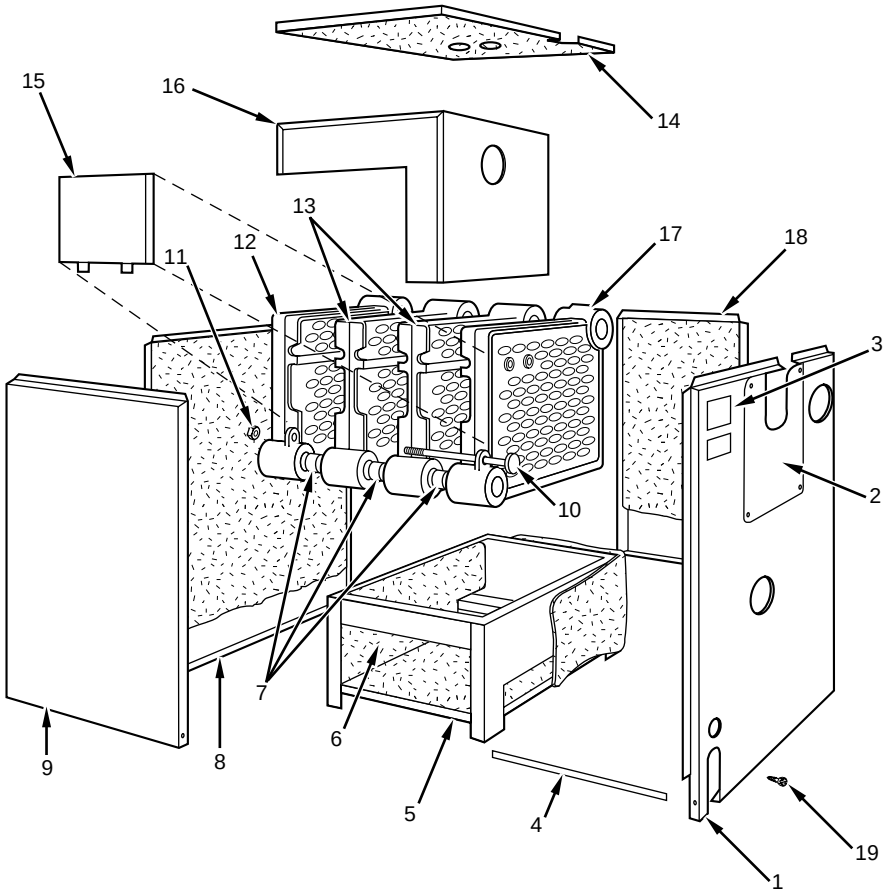
→ **Propane Gas Burners and Manifold Parts**

This is a Repair Parts List—Not a Packing List

KEY NO.	DESCRIPTION	PART NO.					
		2 Section	3 Section	4 Section	5 Section	6 Section	7 Section
1	24-v Gas Valve, Propane Gas	146-62-062	146-62-062	146-62-062	146-62-062	146-62-059	146-62-059
2	Pilot Tube	146-15-005	146-15-005	146-15-005	146-15-005	146-15-006	146-15-006
3	10-32 X 3/16-in. Slotted Hex Head Screw	146-95-301	146-95-301	146-95-301	146-95-301	146-95-301	146-95-301
4	Gas Manifold	146-16-020	146-16-021	146-16-022	146-16-023	146-16-024	146-16-025
5	Main Burner Orifice*	146-15-044	146-15-044	146-15-044	146-15-044	146-15-044	146-15-044
6	Main Burner Less Pilot Bracket†	—	146-15-532	146-15-532	146-15-532	146-15-532	146-15-532
6A	Main Burner with Pilot Bracket	146-15-531	146-15-531	146-15-531	146-15-531	146-15-531	146-15-531
7	Pilot Burner with Orifice, Propane Gas	146-62-093	146-62-094	146-62-094	146-62-094	146-62-094	146-62-094
‡	Rollout Shield	425-00-932	425-00-933	425-00-934	425-00-935	425-00-936	425-00-937

Quantity is 1 unless otherwise noted.
* Requires 1 less than the number of sections.
† Requires 2 less than the number of sections.
‡ Not illustrated.

REPAIR PARTS



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→ **Jacket—Section and Base Parts**

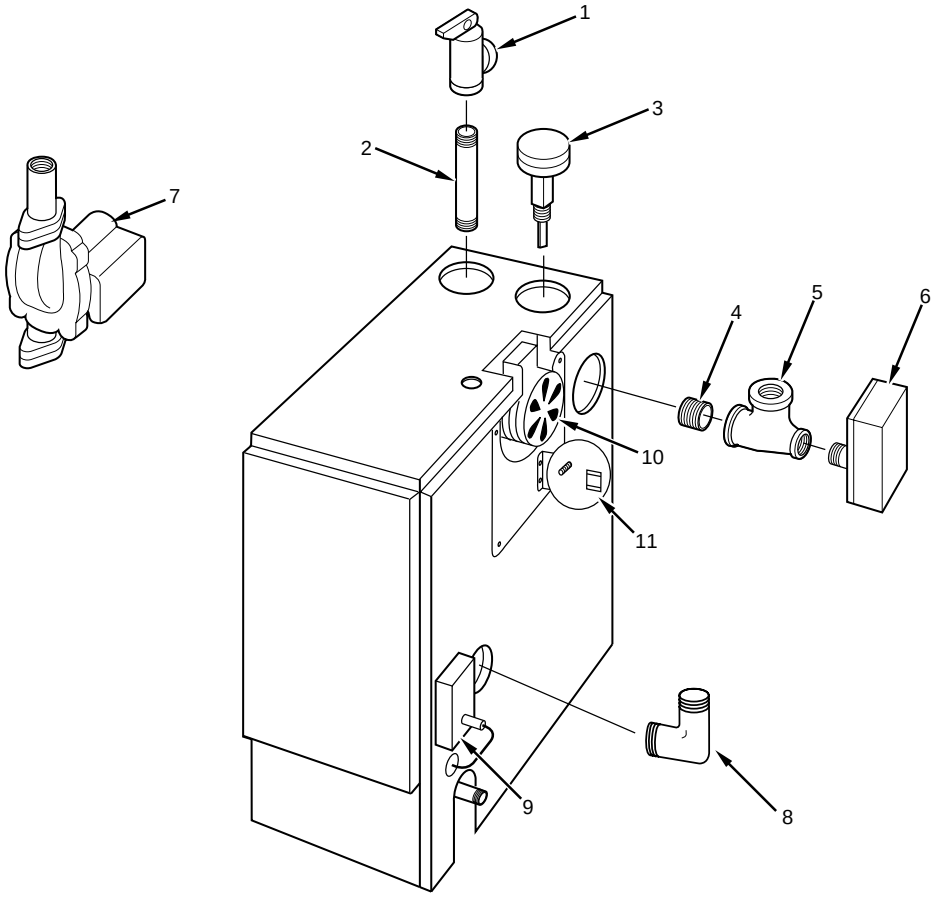
This is a Repair Parts List—Not a Packing List

KEY NO.	DESCRIPTION		PART NO.					
			2 Section	3 Section	4 Section	5 Section	6 Section	7 Section
1	Jacket, Right Side Panel		730-70-1050	730-70-1050	730-70-1050	730-70-1050	730-70-1050	730-70-1050
2	Blower Cover Plate		730-00-1170	730-00-1170	730-00-1170	730-00-1170	730-00-1170	730-00-1170
3	Rating Plate		146-80-901	146-80-901	146-80-901	146-80-901	146-80-901	146-80-901
4	Jacket Tie Bar		425-01-494	425-01-495	425-01-496	425-01-497	425-01-498	425-01-499
5	Boiler Base		425-01-733	425-01-734	425-01-735	425-01-736	425-01-737	425-01-738
6	Base Insulation	Base Side (2 Required)	146-14-020	146-14-020	146-14-020	146-14-020	146-14-020	146-14-020
		Base Front	146-14-112	146-14-113	146-14-114	146-14-115	146-14-116	146-14-117
		Base Rear	146-14-122	146-14-123	146-14-124	146-14-125	146-14-126	146-14-127
7	Nipple, Boiler		433-00-976	433-00-976	433-00-976	433-00-976	433-00-976	433-00-976
8	Jacket, Left Side Panel		730-70-1040	730-70-1040	730-70-1040	730-70-1040	730-70-1040	730-70-1040
9	Jacket, Front Panel		730-70-1032	730-70-1033	730-70-1034	730-70-1035	730-70-1036	730-70-1037
10	1/4-in. Tie Rod (2 Required)		146-05-008	146-05-002	146-05-002	146-05-051	146-05-053	146-05-005
11	Nut and Washer		HW-003.02	HW-003.02	HW-003.02	HW-003.02	HW-003.02	HW-003.02
12	Section, Left End		410-01-019	410-01-019	410-01-019	410-01-019	410-01-019	410-01-019
13	Section, Intermediate		—	410-01-018	410-01-018	410-01-018	410-01-018	410-01-018
14	Jacket, Top Panel		730-70-1012	730-70-1013	730-70-1014	730-70-1015	730-70-1016	730-70-1017
15	Cleanout Plate(s)		425-01-539	425-01-540	425-01-541	425-01-542	(1) 425-01-540 (1) 425-01-541	(2) 425-01-541
16	Flue Collector		730-00-3002	730-00-3003	730-00-3004	730-00-3005	730-00-3006	730-00-3007
17	Section, Right End		410-01-017	410-01-017	410-01-017	410-01-017	410-01-017	410-01-017
18	Jacket, Back Panel		730-70-1022	730-70-1023	730-70-1024	730-70-1025	730-70-1026	730-70-1027
*****	Jacket Complete		730-70-1002	730-70-1003	730-70-1004	730-70-1005	730-70-1006	730-70-1007
19	No. 10 X 1/2-in. Sheet Metal Screw		146-95-074	146-95-074	146-95-074	146-95-074	146-95-074	146-95-074
*****	Block Assembly (Includes 7, 10, 11, 12, 13, 17)		410-01-212	410-01-312	410-01-412	410-01-512	410-01-612	410-01-712
*****	Combustible Floor Base		146-14-031	146-14-031	146-14-031	146-14-031	146-14-032	146-14-032

* Not illustrated.

REPAIR PARTS

→ **BOILER CONTROLS AND PIPING**



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KEY NO.	DESCRIPTION		PART NO.
1	3/4-in. ASME Relief Valve		146-22-011
2	3/4-in. X 5-1/2-in. Nipple		146-07-040
3	Temperature-Pressure Gage—3-1/2-in. Shank		146-23-007
4	1-1/4-in. X 5-1/2-in. Nipple		146-07-019
5	1-1/4-in. X 3/4-in. X 1-1/4-in Tee		1510001
6	L8148A Combination Hi Limit and Relay Control		433-00-521
7	Taco 007 Circulator		CI-001.03
*	Grundfos UP15-42F Circulator		CI-006.03
8	1-1/4-in. Bent Return Nipple		146-07-004
9	Intermittent Pilot Control (1003-620)		146-62-070
10	Induced Draft Blower and Gasket		433-00-511
11	Pressure Switch	2, 3, 4, 5 Section	146-55-006
		6, 7 Section	146-55-005
*	Rubber Tube (Blower to Pressure Switch)		146-29-003
*	Rollout Switch		146-29-002
*	1-1/4-in X 3/4-in. Bushing		146-93-006
*	Taco Flange Set		146-26-049
*	Grundfos Flange Set		146-26-050
*	AT 140C 24-v Transformer		146-62-080
*	1/4-in. Close Nipple		146-07-031
*	1/4-in. Coupling		146-93-054
*	400°F Black Silicone Rubber Adhesive Sealant (10.3 oz cartridge)		146-06-020
*	3-in. X 4-in. Increaser Fitting — Galvanized		146-28-012

* Not illustrated.

SERVICE TRAINING

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